Remarks

In the Advisory Action the Examiner noted that the "limitation of having the plasma sputtering deposition disposed onto the elastomeric material was not considered in the finally rejected claims." The applicants respectfully request that this feature be considered at this time...

The Examiner further acknowledge that the Applicants' reply has overcome the following rejection(s): (1) The restriction requirement has been overcome by cancellation of claims 16-20; (2) The 35 U.S.C. 1st paragraph rejection to claims 1, 14 and 15; and (3) The 35 U.S.C. 2nd paragraph rejection of claim 4.

Claim 1 – 35 USC 102e

The Examiner contended in regard to claim 1 that resist has some elasticity to it since it is a polymer. Hence, the Examiner argued that **Ikeda** anticipated each and every element of claim 1.

Amended claim 1 is directed to improvement in a method of microfabricating a structure in deformable silicone elastomer comprising photolithographically fabricating the three dimensional structure in the deformable silicone elastomer using semiconductor fabricating procedures, which include reactive sputtering a layer including silicon onto the silicone elastomer. This then allows for the formation of masking layers on the silicone elastomer by means of which the structure is photolithographically

microfabricated.

Consider specifically the feature of reactive sputtering of a layer onto the silicone elastomer for photolithographic processing thereafter. The Examiner cited **Ikeda** as forming a three-dimensional structure on a substrate by using a thin layer of chromium 2 deposited on the substrate 1 in stripe form by sputtering.[1] After formation of the chromium layer a resist layer was coated onto the whole surface of the substrate. However, the resist was cured and was not an elastomer layer as contended.[2] No layer is ever reactive sputtered onto the resist layer in **Ikeda**. The resist layer is then irradiated with ultraviolet radiation through the transpartent substrate with the chromium patterned layer as a mask.[3] The **Ikeda** process cannot be used if the substrate is not transparent, which in **Ikeda** was glass. The exposed, unmasked areas were removed yielding the patterned as shown in Fig. 10(E).[4] **Ikeda** is summarized in the table below and compared to the claimed invention.

Ikeda	**Claim 1**
a pattern of chromium 2 is laid down on a **transparent** substrate by sputtering – Fig. 10B.	No such layer is formed
a resist layer 5 is spun coated onto the patterned chromium and thermoset – Fig. 10C.	Unpatterned elastomer is laid down on a substrate, which need not be transparent
the resist layer 5 is then irradiated through the substrate using the	No such step

[1] (Column 17 lines 19-23, lines 27-31)
[2] (Column 18 lines 8-15)
[3] (Column 18 lines 28-48)
[4] (Column 18 lines 49-57)

chromium 2 **as a mask underneath the resist layer 5** – Fig. 10D.	
No corresponding step	A silicon-bearing, primer layer is reactively sputtered onto the elastomeric layer to reduce its surface tension.
the unmasked areas of resist are removed– Fig. 10E.	Resist or other layers may be selectively laid down on the primer layer for conventional photolithography

The methods are quite different. The thermoset resist of **Ikeda** is not a deformable silicone elastomer in any sense of the word and does not share the surface tension problems of silicone elastomers. Prior to the invention, apart from replication molding, injection molding or embossing, there were no other methods for processing silicone elastomers. Conventional photoresist processing as taught by **Ikeda** cannot be practiced on elastomers because the large surface tension prevents the spin-coating of continuous resist films with uniform thickness. **Ikeda** does not show photoresist processing on an elastomer using a reactive sputter deposition on the elastomer, but simply teaches conventional resist spin coating on metal. The fact that **Ikeda** uses the metal to photolithograph the resist instead of the reverse doesn't teach how to use photolithography to fabricate structures in silicone elastomers on which resist cannot be practically used. A resist and a silicone elastomer are not the same material.

It cannot be maintained that each and every element of claim 1 is taught by **Ikeda**.

Claims 21 - 25

The Examiner maintained the 1st paragraph rejection of claims 21 - 25 because he contends that Applicant failed to point out where in the specification the combination of directional etching and sputtering for masking is shown. The Examiner contends that the statement that directional etching is one focal point of the invention but it is not clear in showing the combination of the etching and sputtering steps.

Paragraphs 0007 – 012 describe laying down a silicon-bearing or surface-tension-reducing layer on an elastomer by reactive sputtering by which masking layers may then be defined on the siliceous layer. Paragraphs 013 and 014 describe then directionally RF plasma etching the elastomer. It can be understood by the mere juxtaposition of disclosure that the elastomer may be masked using reactive sputter deposition of the primer layer followed by or combined with selectively removal or etching of the masked elastomer by directional RF plasma etching.

Similarly, paragraph 016 and Fig. 1 illustrate and describe a reactive sputter deposition system in which the method of the invention may be practiced, and paragraph 0017 and Fig. 2 illustrate and describe a plasma etching system.

Still further paragraphs 019 – 021 describe a reactive sputter deposition system. Paragraphs 022 – 030 describe a plasma etching system to etch the elastomer masked according to the disclosure of the preceding paragraphs 019 – 021. The disclosures present a logical sequence in which

a reactive plasma sputtering step is used to mask the elastomer and then once masked the elastomer is directionally etched using a plasma directional etching step.

The combination of sputtering for masking and directional etching is the sequence of description laid out in the Brief Summary of the Invention, the drawings and the Detailed Description. It cannot be maintained in view of the disclosure describing sputtering for masking immediately then describing directional etching of the masked object that there is no teaching or disclosure of their combination, i.e. using these two steps in sequence.

Advancement of the claims as amended to allowance is respectfully requested.

Respectfully submitted,

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